What is claimed is:

[Claim 1] A method of manufacturing a self-aligned guard ring of a photo diode comprising:

providing a semiconductor substrate with a photo diode region defined on the semiconductor substrate, and an isolation matter surrounding the photo diode region;
forming a photo sensor mask on the semiconductor substrate;
utilizing the photo sensor mask as a block for performing a first ion implantation process to create a photo sensor inside the photo diode region in the semiconductor substrate;
forming a first mask on the photo sensor;
removing the photo sensor mask;
forming a spacer around the first mask;
forming a second mask on the isolation matter outside edge and the second mask exposing the photo diode region;
utilizing the first mask, the spacer, and the second mask as a block for performing a second ion implantation process to create a self-aligned guard ring surrounding the photo sensor; and
removing the first mask, the spacer, and the second mask.

[Claim 2] 2. The method of claim 1, wherein the isolation matter comprises a shallow trench isolation (STI) and a field oxide (FOX).

[Claim 3] 3. The method of claim 1, wherein the photo sensor mask covers the isolation matter and exposes a part of the photo diode region.

[Claim 4] 4. The method of claim 1, wherein the first ion implantation process implants N type dopant, and the second ion implantation process implants P type dopant.

[Claim 5] 5. The method of claim 1, wherein the depth of the self-aligned guard ring is greater than the depth of the isolation matter, and the self-aligned guard ring covers a part of the isolation matter.

[Claim 6] 6. The method of claim 1, wherein the semiconductor substrate further comprises at least a pad layer, and the masks are all formed on the pad layer.

[Claim 7] 7. A method of manufacturing a self-aligned guard ring of a photo diode comprising:

providing a semiconductor substrate with a photo diode region defined on the semiconductor substrate, and an isolation matter surrounding the photo diode region;

forming a first mask on the semiconductor substrate covering the isolation matter and exposing a part of the photo diode region;

forming a spacer around the first mask;

utilizing the first mask and the spacer as a block for performing a first ion implantation process to create a photo sensor inside the photo diode region in the semiconductor substrate;

removing the spacer;

forming a second mask on the semiconductor substrate where the semiconductor substrate is not covered by the first mask, and then removing the first mask;

forming a third mask on the isolation matter outside edge and the third mask exposing the photo diode region;

utilizing the second mask and the third mask as a block for performing a second ion implantation process to create a self-aligned guard ring surrounding the photo sensor; and

removing the second mask and the third mask.

[Claim 8] 8. The method of claim 7, wherein the isolation matter comprises a shallow trench isolation (STI) and a field oxide (FOX).

[Claim 9] 9. The method of claim 7, wherein the first ion implantation process implants N type dopant, and the second ion implantation process implants P type dopant.

[Claim 10] 10. The method of claim 7, wherein the depth of the self-aligned guard ring is greater then the depth of the isolation matter, and the self-aligned guard ring covers a part of the isolation matter.

[Claim 11] 11. The method of claim 7, wherein the semiconductor substrate further comprises at least a pad layer, and the masks are all formed on the pad layer.

[Claim 12] 12. A method of manufacturing a self-aligned guard ring comprising:

providing a semiconductor substrate with at least a device region defined on the semiconductor substrate;

forming a first mask on the semiconductor exposing a part of the device region;

forming a second mask on the semiconductor substrate where the semiconductor substrate is not covered by the first mask;

removing the first mask;

uniformly increasing the covering area of the second mask;

forming a third mask on the surface of the semiconductor substrate and the third mask exposing the device region and the second mask;

utilizing the second mask and the third mask as a block for performing a first ion implantation process to create a self-aligned guard ring ; and

removing the second mask and the third mask.

[Claim 13] 13. The method of claim 12, wherein the device region is a photo diode region, and the semiconductor substrate further comprises an isolation matter surrounding the photo diode region.

[Claim 14] 14. The method of claim 13 further comprising a second ion implantation process after the first mask is formed for creating a photo sensor inside the photo diode region in the semiconductor substrate.

[Claim 15] 15. The method of claim 14, wherein the first ion implantation process implants P type dopant, and the second ion implantation process implants N type dopant.

[Claim 16] 16. The method of claim 13, wherein the isolation matter comprises a shallow trench isolation (STI) and a field oxide (FOX).

[Claim 17] 17. The method of claim 13, wherein the depth of self-aligned guard ring is greater then the depth of the isolation matter, and the self-aligned guard ring covers a part of the isolation matter.

[Claim 18] 18. The method of claim 12, wherein the semiconductor substrate further comprises at least a pad layer, and the masks are all formed on the pad layer.

[Claim 19] 19. A method of manufacturing a self-aligned guard ring comprising:

providing a semiconductor substrate with at least a device region defined on the semiconductor substrate;

forming a first mask on the semiconductor exposing a part of the device region;

uniformly shrinking the covering area of the first mask;

forming a second mask on the semiconductor substrate where the semiconductor substrate is not covered by the first mask;
removing the first mask;
forming a third mask on the surface of the semiconductor substrate and the third mask exposing the device region and the second mask;
utilizing the second mask and the third mask as a block for performing a first ion implantation process to create a self-aligned guard ring ; and
removing the second mask and the third mask.

[Claim 20] 20. The method of claim 19, wherein the device region is a photo diode region, and the semiconductor substrate further comprises an isolation matter surrounding the photo diode region.

[Claim 21] 21. The method of claim 20 further comprising a second ion implantation process after the first mask is formed for creating a photo sensor inside the photo diode region in the semiconductor substrate.

[Claim 22] 22. The method of claim 21, wherein the first ion implantation process implants P type dopant, and the second ion implantation process implants N type dopant.

[Claim 23] 23. The method of claim 20, wherein the isolation matter comprises a shallow trench isolation (STI) and a field oxide (FOX).

[Claim 24] 24. The method of claim 20, wherein the depth of self-aligned guard ring is greater then the depth of the isolation matter, and the self-aligned guard ring covers a part of the isolation matter.

[Claim 25] 25. The method of claim 12, wherein the semiconductor substrate further comprises at least a pad layer, and the masks are all formed on the pad layer.